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Maritimes Region
Canadian Science Advisory Secretariat
Science Response 2013/020

SCALLOP FISHERY AREA/TIME CLOSURE TO REDUCE YELLOWTAIL FLOUNDER BY-CATCH ON GEORGES BANK IN 2013

Context

An area of Georges Bank, approximately 38 nautical miles2, was closed to the offshore scallop fishery during June 2012 to reduce yellowtail flounder by-catch. The closure area was determined following a review of yellowtail flounder by-catch distribution and relative abundance during the month of June (which coincides with the latter part of the spawning season and the opening of the Georges Bank groundfish fishery) and was based on observed groundfish trips from the otter trawl fleet (2005–2011) and observed scallop fishing trips (2001-2011, except 2003). Temporal trends in the distribution of the offshore scallop fishery between 1997 and 2011 were also considered. The methodology for the development of scallop fishery time/area closures to reduce yellowtail bycatch follows that initially described in DFO, 2007.

This report provides an update to the 2012 report (DFO 2012) on the scallop fishery area/time closure to reduce yellowtail flounder by-catch on Georges Bank, and includes an analysis of 2012 yellowtail by-catch rates based on observed trips from the groundfish otter-trawl fishery and the offshore scallop fishery on Georges Bank. Seasonal and geographic distribution patterns of yellowtail by-catch in both fisheries were also evaluated since yellowtail discard rates in the scallop fishery are traditionally at seasonal highs during the second quarter (April to June) which coincides with the time of yellowtail spawning on eastern Georges Bank (O'Brien et al., 1993). Although there were also several exploratory yellowtail-directed trips carried out in 5Zm in 2012, they were considered to be different from groundfish otter trawl trips where yellowtail occur as a bycatch and therefore were not included in the updated analyses.

This Science Response Report results from the Science Response Process of May 2013 on the Update for Scallop Fishery Area/Time Closure to Reduce Yellowtail Flounder By-catch on Georges Bank in 2013.

Response

Yellowtail Flounder By-Catch in the Groundfish Fishery

While observer coverage of the otter trawl fishery in 5Zjm extends back to earlier years, the time series of by-catch rates used to examine the spatial distribution of yellowtail flounder starts in 2005 when coverage increased significantly. In 2012, at-sea observer coverage of the groundfish otter trawl fleet was about 20% (observed catch (mt)/total catch (mt)) with a total of 2440 sets monitored (Table 1) compared to 1572 sets in 2011. The totals found in Table 1 and Figure 1 include all of unit areas 5Zj and 5Zm, which has a greater spatial extent than described in the subsequent figures for the offshore scallop fishery. Observed sets occurred in all months except March, April and May (Table 1; note: there is no Canadian groundfish fishery in 5Zjm from mid-February to the end of May). The majority of observed sets (91%) were from 5Zj, particularly along the northern edge of the bank, except during June and July when some fishing occurred in 5Zm just below the 5Zjm boundary. Of the 2440 sets observed in 2012, 82% (n=2004) caught no yellowtail flounder, compared to 84% in 2011, 80% in 2010, 79% in 2009, 69% in 2008, 76% in 2007, and 78% in 2006. As in previous years, by-catch rates were

standardized to catch per hour (kg/hour) and then plotted to compare by-catch rates spatially by month (i.e. kg/hr for sets aggregated to cells of 5 minutes longitude x 3.33 minutes latitude; approximately 12.5 nm2 or 43 km2 per cell). Yellowtail flounder were present in the observed sets for all months in 5Zj, but only for June through September in 5Zm.

The highest monthly average by-catch rates in 2012 occurred in June in both 5Zj (1.26 kg/hr) and 5Zm (2.07 kg/hr) (Figure 1). Catch rates in other months were considerably lower, especially during January and February and from September through December in 5Zj. While catch rates were generally quite low in 2012, the seasonal pattern of higher catchability in June is a persistent feature. For example, in several past years (2005, 2006, 2008 and 2009), the maximum catch rate occurred in June for both 5Zm and 5Zj. An exception was in 2011, when peak catch rates occurred in July (5Zj) and October (5Zm). Although higher by-catch rates were reported in 2011 (i.e. 65.0 kg/hr in 5Zj and 178.0 kg/hr in 5Zm; DFO, 2012) compared to 2012, catch and effort data from 3 yellowtail directed trips were included in the analyses and may have biased estimates upwards for September and October when these trips occurred. Noteworthy is that the most recent assessment of the Georges Bank (5Zhjmn) yellowtail flounder stock conducted in 2012 indicated that current adult biomass is at a very low level (approximately 4300 mt; Legault et al. 2012). Consequently, by-catch rates may be lower at present compared to earlier years.

Cells with by-catch rates ≥ 5 kg/hour (a proxy for high density areas) occurred in June and July just above and below the 5Zjm line close to the international boundary, and in August in 5Zj on the northwestern part of the bank (Figure 2). This spatial pattern was different from 2011 for June and August but not July.

Since 2004, there has been no directed Canadian fishery for yellowtail flounder on Georges Bank because fishermen have been unable to find densities which would support a commercial fishery. The industry has conducted exploratory fishing operations in some years since 2004 (i.e. in 2011 and 2012) to determine if fishable concentrations are present. In 2012, there was an exploratory yellowtail-directed fishery conducted mainly in 5Zm which involved three vessels. A total of 9 trips with 100% observer coverage occurred between September and November. The data from these trips was not included in the by-catch analyses due to differences in gear configuration and fishing practices (i.e. use of larger cod end mesh (155 mm square vs 130 mm square) and a "closed off" separator panel to retain yellowtail); features which would make these trips non-comparable to groundfish otter trawl trips where yellowtail occur as a bycatch. Of the 265 observed directed yellowtail sets, 98% (n=259) occurred in 5Zm, with average catch rates of 98.0, 60.0 and 9.0 kg/hr for September through November, respectively Cells with catch rates ≥ 50 kg/hr in September and October occurred in 5Zm near the international boundary in an area known as the "Yellowtail Hole" (Figure 3).

The spatial distribution of observed otter trawl sets from 2005 to 2012 for the month of June (when yellowtail by-catch rates are generally highest) covered all of 5Zj and the western portion of 5Zm (Figure 4). In Figure 4, cells are shaded according to the annual average by-catch rate for the month of June from 2005 to 2012 combined. Seven cells, labeled in descending order, on the Canadian portion of Georges Bank have an average by-catch rate greater than 10 kg/hour. These range from 10.50 (cell 7) to 165.44 kg/hour (cell 1) and are identical in rank and location to those reported in the 2012 report (DFO, 2012). Four of these high catch rate cells (2, 3, 4, and 6) in 5Zm are in the vicinity of what is known as the Yellowtail Hole where a directed Canadian fishery was conducted from 1995-2004. The three high catch rate cells in 5Zj (1, 5 and 7) are relatively close together and were the cells selected for closure in June 2012. The by-catch rate of cell 1 is extremely high (165.44 kg/hour) compared to the other cells. This estimate is driven by observations in June 2006 (320 kg/hour). The by-catch rate of

cell 7, adjacent to cell 1, is significantly lower at 10.50 kg/hour. By-catch rates for cells 6 to 2 range from 10.52 to 32.00 kg/hour during the period considered.

Yellowtail Flounder By-Catch in the Offshore Scallop Fishery

As in previous years, the target observer coverage in the offshore scallop fleet for 2012 on Georges Bank was two trips per month. A total of 20 trips were observed, with limited fishing activity in January and December. In 2012, there were four cells (5 minutes longitude x 3.33 minutes latitude) that had a by-catch rate greater than 5 kg/dredge, which only occurred in March (Figure 5; note there is no December panel due to no coverage). The 2012 offshore scallop monthly by-catch data was combined with the data from 2001 to 2011, except 2003. From this scenario, there was only one cell with catch rates greater than 50 kg/dredge, which occurred in April (Figure 6; note there is no December panel due to no coverage).

Estimated annual discards of yellowtail flounder in the Canadian Georges Bank scallop fishery decreased again in 2012 to approximately 41 mt from 51 mt in 2011. Table 2 provides the total estimated annual discards for this fishery since 1995 (Legault et al. 2012, Van Eeckhaute et al. 2011).

Monthly average by-catch rates from observed scallop trips from 2001 to 2012 are much less indicative of yellowtail flounder distribution than otter trawl observed trips. This is due to less extensive spatial coverage of the observed scallop trips and by-catch avoidance protocols put in place by the offshore scallop fleet.

Catches of the Offshore Scallop Fishery

Georges Bank second quarter scallop catch data for 2012 (Figure 7) was integrated with the past years' series where the catch data for the second quarter of the year was aggregated in cells of 5 minutes longitude x 3.33 minutes latitude (Figure 8). Second quarter catches (2041 mt of meats) comprised 50% of the total landings in 2012 on Georges Bank, with fishing activities highly concentrated in zone 5Zj (Figure 7). The 1997 to 2012 second quarter catch data (Figure 8) are consistent with previously observed spatial patterns (e.g. see DFO 2012). Cells in the northern part of Georges Bank have higher scallop catches than cells located in the southern part. Limited fishing occurred on Georges Bank 'b' in 2012 (three trips). With the inclusion of the 2012 catch data, one additional cell with an average catch over 50 mt has been added to those reported in the previous yellowtail closure report (DFO 2012). Voluntary closures initiated in January 2012 are provided in Figures 2 through 9, while those closure areas modified (seed box) or added (a/b line closure) in November 2012 are indicated in the last panel of Figures 5 and 6.

Conclusions

Yellowtail flounder by-catch trends from observed groundfish otter trawl fishery and scallop fishery trips for the last eight years (2005–2012) can be used to determine areas of high yellowtail densities. While average monthly by-catch rates for the otter trawl fishery decreased substantially in 2012 compared to 2011 (largely due to the inclusion of 3 directed yellowtail trips in the analyses for 2011), the seasonal pattern of higher catchability in June continues to be a persistent feature in both 5Zj and 5Zm. In the updated analyses for groundfish otter trawl trips for the month of June (2005-2012 combined), there were 7 cells with an average bycatch rate greater than 10 kg/hr which were identical in rank and location to those reported in the 2012 report (DFO 2012).

In the 2012 scallop fishery there was only one cell (March) with a yellowtail flounder by-catch rate greater than 5 kg/dredge (Figure 5).

Impacts of the June 2012 area/time closure were as follows: three cells were closed in 5Zj (which were also closed from 2009 to 2011), which correspond to cells 1, 5, and 7 in Figure 4 of this document, causing fishing activities to be displaced. For 2012, the five cells located in the vicinity of the Yellowtail Hole did not require closing as the offshore scallop fleet did not plan to fish this area in June.

Using the by-catch rates from the otter trawl fishery as an established proxy for yellowtail flounder density and distribution, seven cells with rates greater than 10 kg/hour could qualify for an area/time closure in 2013. These cells have the same location and ranking as cells indicated in 2012. The closure of the cluster of cells 2, 3, 4, and 6 located in the vicinity of the Yellowtail Hole would likely have a minimal impact on scallop fishing activities (Figure 9). Much of scallop fishing activity on Georges Bank in 2012 took place in 5Zj northwest of where cells 1, 5 and 7 are located.

Sources of Information

DFO. 2007. Scallop Fishery Area/Time Closure to Reduce Yellowtail Flounder Bycatch on Georges Bank in 2007. DFO Can. Sci. Advis. Sec. Sci. Resp. 2007/001.

DFO. 2012. Scallop Fishery Area/Time Closure to Reduce Yellowtail Flounder By-Catch on Georges Bank in 2012. DFO Can. Sci. Advis. Sec. Sci. Resp. 2012/015.

Gavaris, S., Sameoto, J., Glass, A., and I. Jonsen. 2009. Discards of Atlantic Cod, Haddock, and Yellowtail Flounder from the 2008 Canadian Scallop Fishery on Georges Bank. TRAC Ref. Doc. 2009/06.

Legault, C.M., L. Alade, H.H. Stone, and W.E. Gross. 2012. Stock Assessment of Georges Bank Yellowtail Flounder for 2012. TRAC Ref. Doc. 2012/02.

O'Brien L., Burnett, L.J., and R.K. Mayo. 1993. Maturation of nineteen species of finfish off the Northeast coast of the United States, 1985-1990. NOAA Tech. Rep. NMFS 113.

Van Eeckhaute, L., Wang, Y., Sameoto, J., and A. Glass. 2011. Discards of Atlantic Cod, Haddock, and Yellowtail Flounder from the 2010 Canadian Scallop Fishery on Georges Bank. TRAC Ref. Doc. 2011/05.

Table 1: Number of observed otter trawl sets and average yellowtail flounder catch rate (kg/hour) by month in 2012 in unit areas 5Zj and 5Zm, excluding the directed yellowtail fishery. Note: There was no groundfish fishery from February 5 to May 31, 2012.

	Number of sets			Average catch rate (kg/hour)	
	Unit Area			Unit Area	
Month	5Zj	5Zm	Total	5Zj	5Zm
1	132		132	0.010	
2	77		77	0.036	
3					
4					
5					
6	238	124	362	1.260	2.065
7	831	84	915	0.473	1.951
8	321	7	328	0.346	0.000
9	81	1	82	0.079	0.585
10	110		110	0.012	
11	164		164	0.018	
12	269	1	270	0.015	0.000
Total/Avg	2223	217	2440	0.370	1.938

Table 2: Estimated annual discards of yellowtail flounder (mt) in the Canadian Offshore Scallop Fishery on Georges Bank (from Van Eeckhaute et al. 2011; updated for 2011 and 2012).

Year	Estimated Annual Discards (*mt*)
2012	41
2011	51
2010	200
2009	84
2008	117
2007	96
2006	504
2005	246

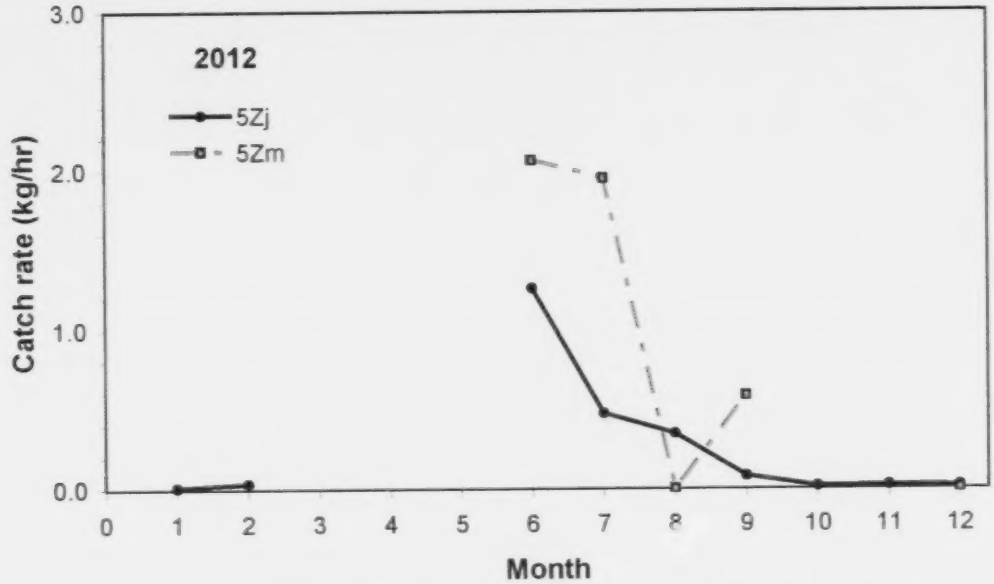

Figure 1: Average yellowtail flounder catch rate (kg/hour) by month and NAFO unit area for observed otter trawl sets in 2012 (excluding directed trips).

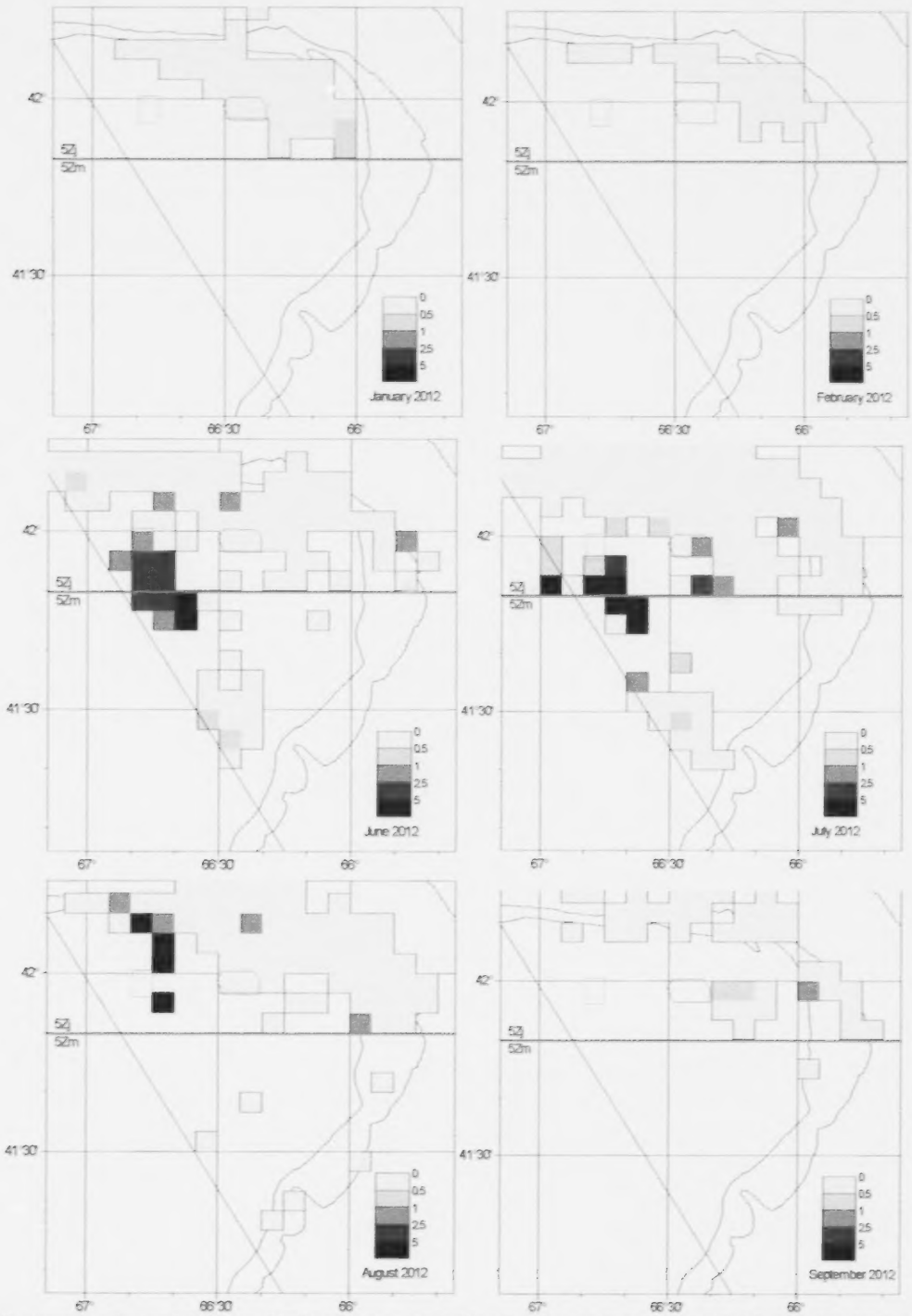

Figure 2: Average by-catch rates (kg/hour aggregated by 5 minutes longitude x 3.33 minutes latitude) for yellowtail flounder in 2012 for observed otter trawl sets on Georges Bank. The areas outlined in red (seed) and blue (grow-out) are the voluntary scallop closure areas that were implemented in January

2012. The horizontal red line indicates the NAFO divisions 5Zj and 5Zm. There was no groundfish fishery from February 5 to May 31, 2012.

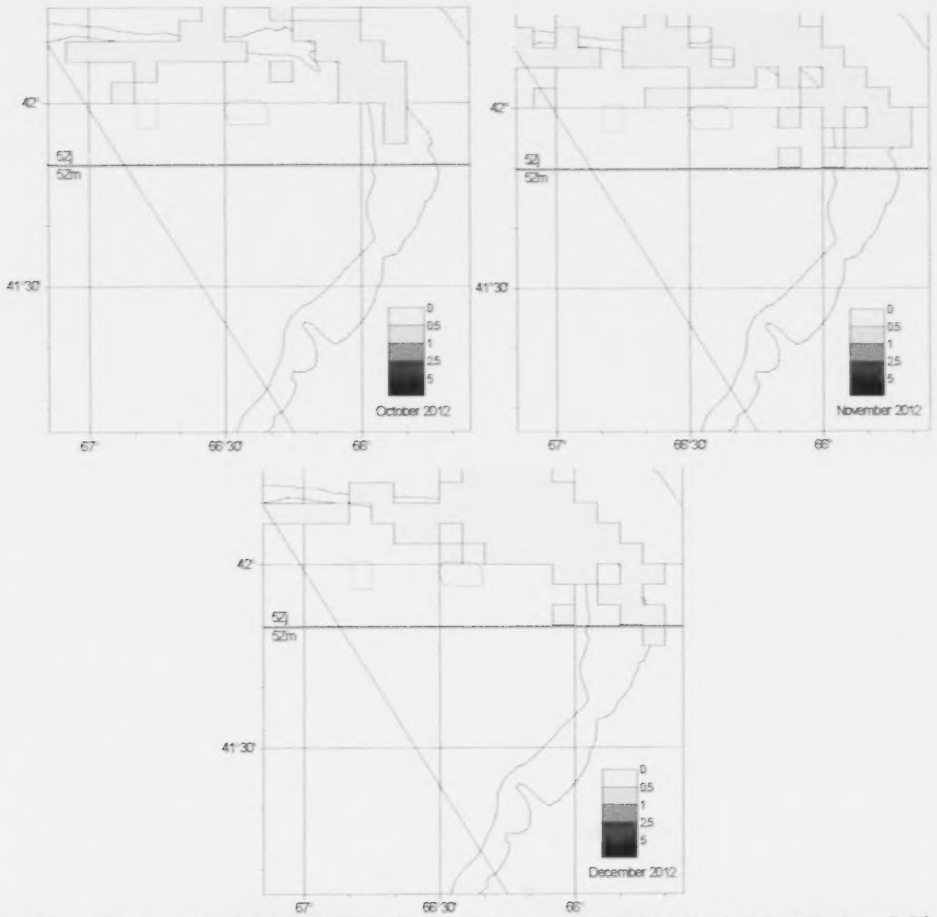

Figure 2 (continued): Average by-catch rates (kg/hour aggregated by 5 minutes longitude x 3.33 minutes latitude) for yellowtail flounder in 2012 for observed otter trawl sets on Georges Bank. The areas outlined in red (seed) and blue (grow-out) are the voluntary scallop closure areas that were implemented in January 2012. The horizontal red line indicates the NAFO divisions 5Zj and 5Zm. There was no groundfish fishery from February 5 to May 31, 2012.

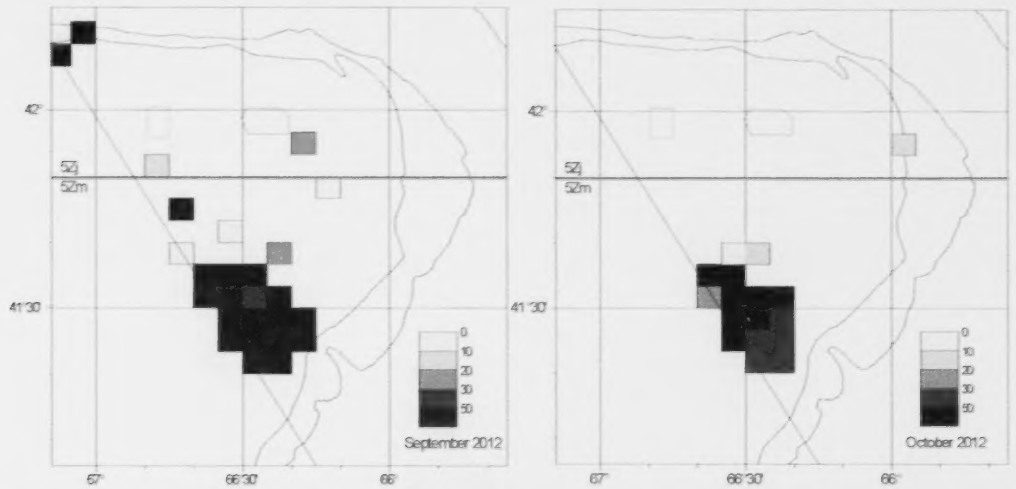

Figure 3: Average by-catch rates (kg/hour aggregated by 5 minutes longitude x 3.33 minutes latitude) for yellowtail flounder for directed bottom trawl sets on Georges Bank in September and October, 2012 (Note difference in scale). The trips had 100% observer coverage. The areas outlined in red (seed) and blue (grow-out) are the voluntary scallop closure areas that were implemented in January 2012. The horizontal red line indicates the NAFO divisions 5Zj and 5Zm.

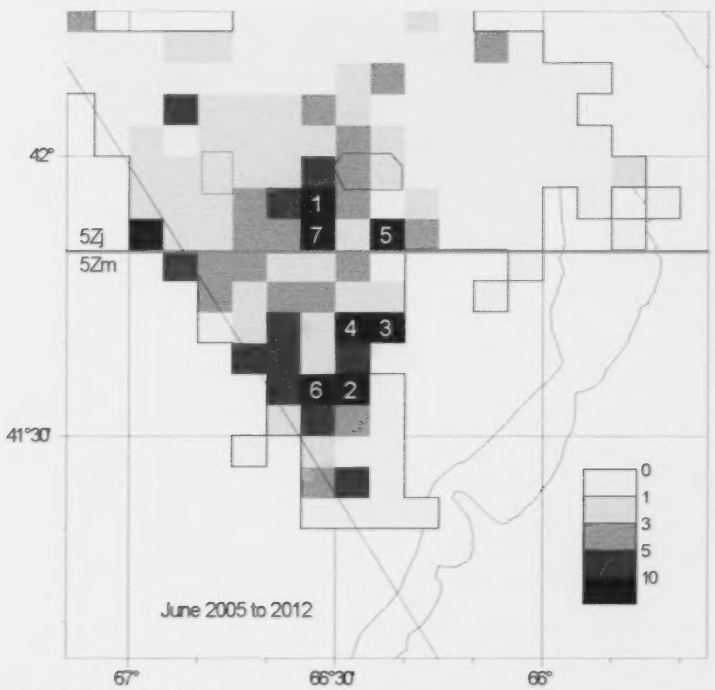

Figure 4: Average yellowtail flounder by-catch rates (kg/hour aggregated by 5 minutes longitude x 3.33 minutes latitude) for the month of June, 2005 to 2012, for observed otter trawl sets on Georges Bank. Cells located on the Canadian side with rates greater than 10 kg/hour are labeled in descending order. The areas outlined in red (seed) and blue (grow-out) are the voluntary scallop closure areas that were implemented in January 2012. The horizontal red line indicates the NAFO divisions 5Zj and 5Zm.

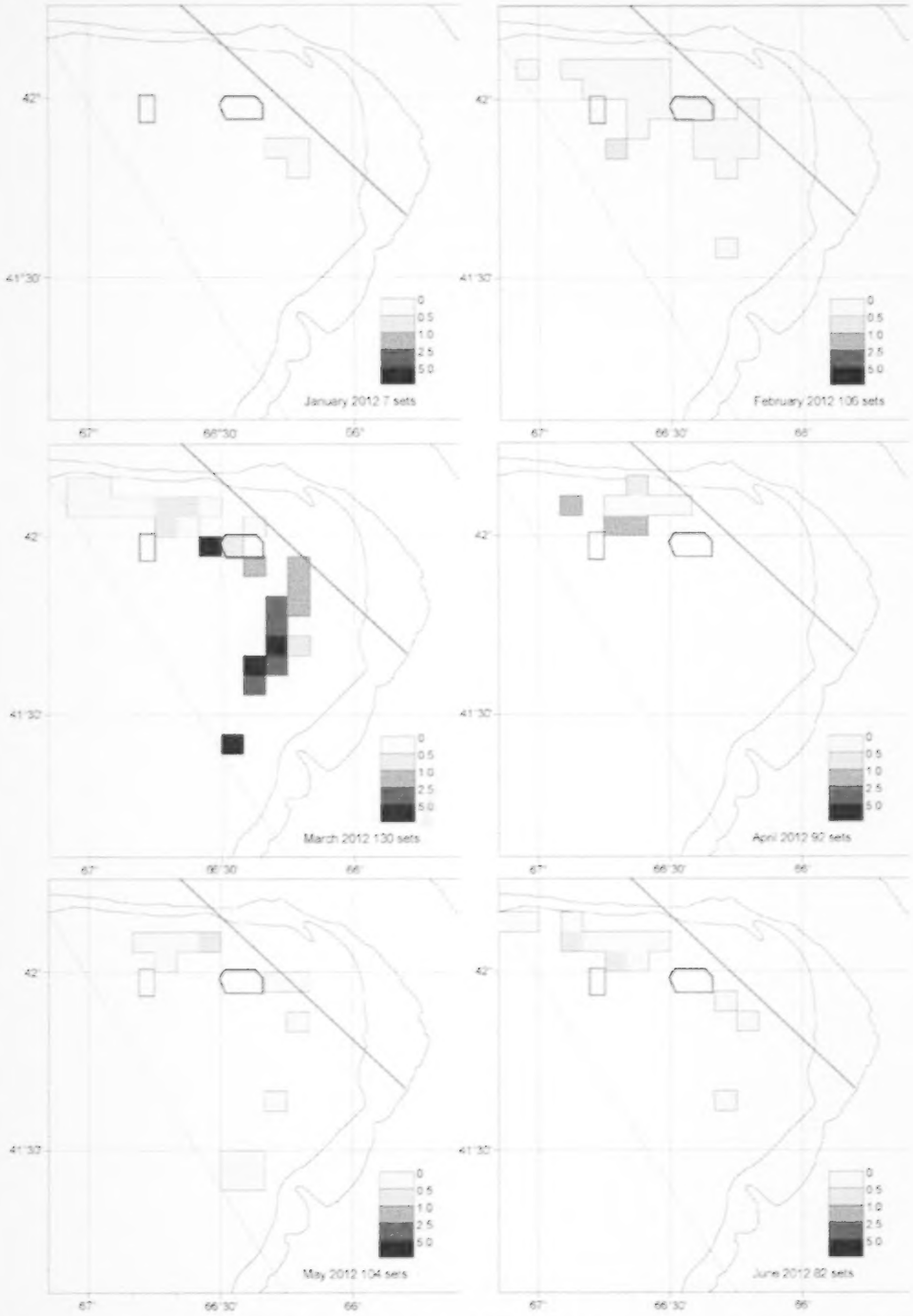

Figure 5: Average by-catch rates (kg/dredge) of yellowtail flounder on a monthly basis in 2012 from observed scallop trips on Georges Bank. The areas outlined in red (seed) and blue (grow-out) are the voluntary scallop closure areas that were implemented in January 2012. The diagonal red line indicates the division between the scallop management areas of Georges Bank 'a' and Georges Bank 'b'.

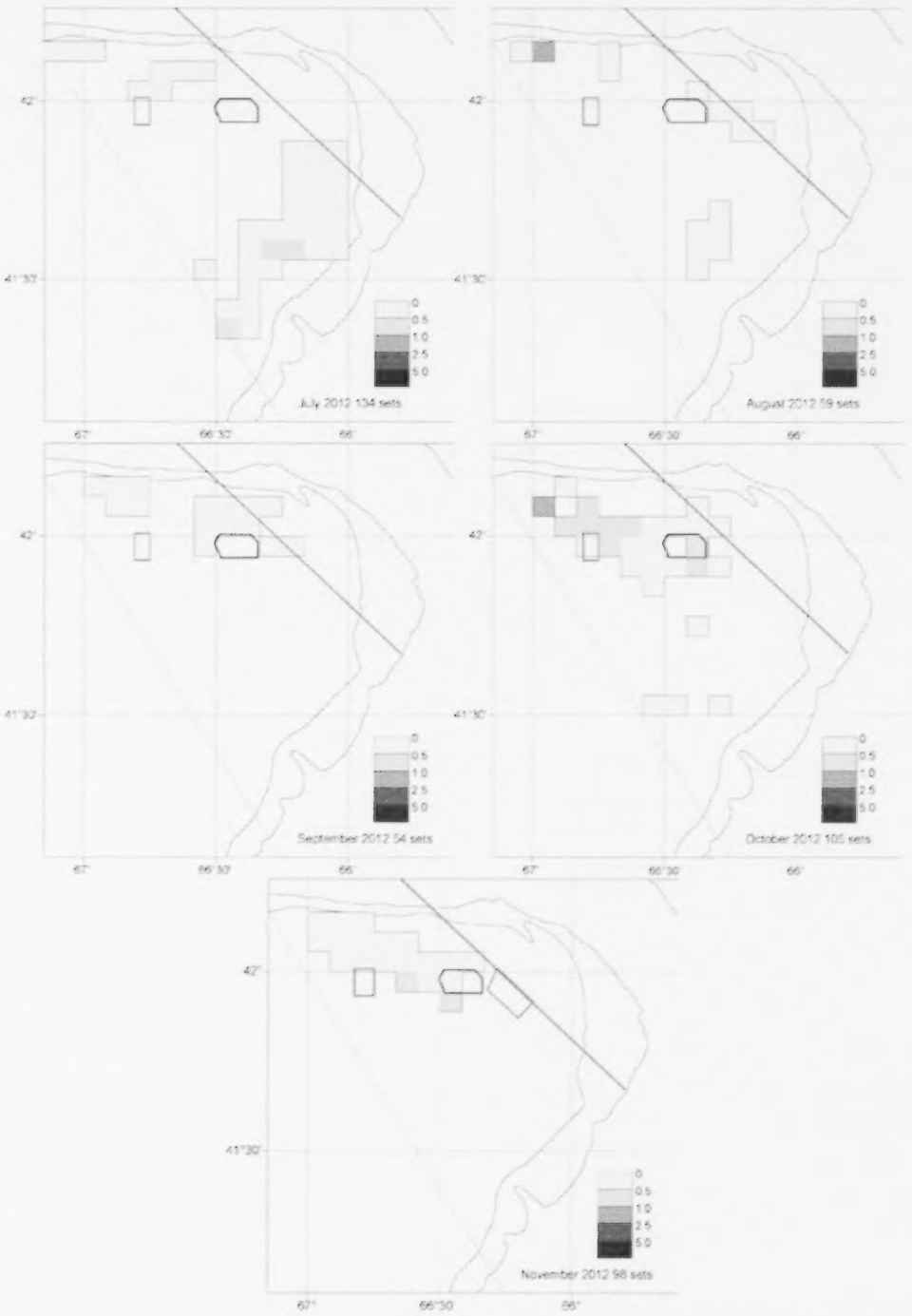

Figure 5 (continued): Average by-catch rates (kg/dredge) of yellowtail flounder on a monthly basis in 2012 from observed scallop trips on Georges Bank. The areas outlined in red (seed, modified November 2012) and blue (grow-out) are the voluntary scallop closure areas that were implemented in January 2012. The current voluntary closure areas, including an additional one indicated in green added in November, are indicated in the last panel. The diagonal red line indicates the division between the scallop management areas of Georges Bank 'a' and Georges Bank 'b'.

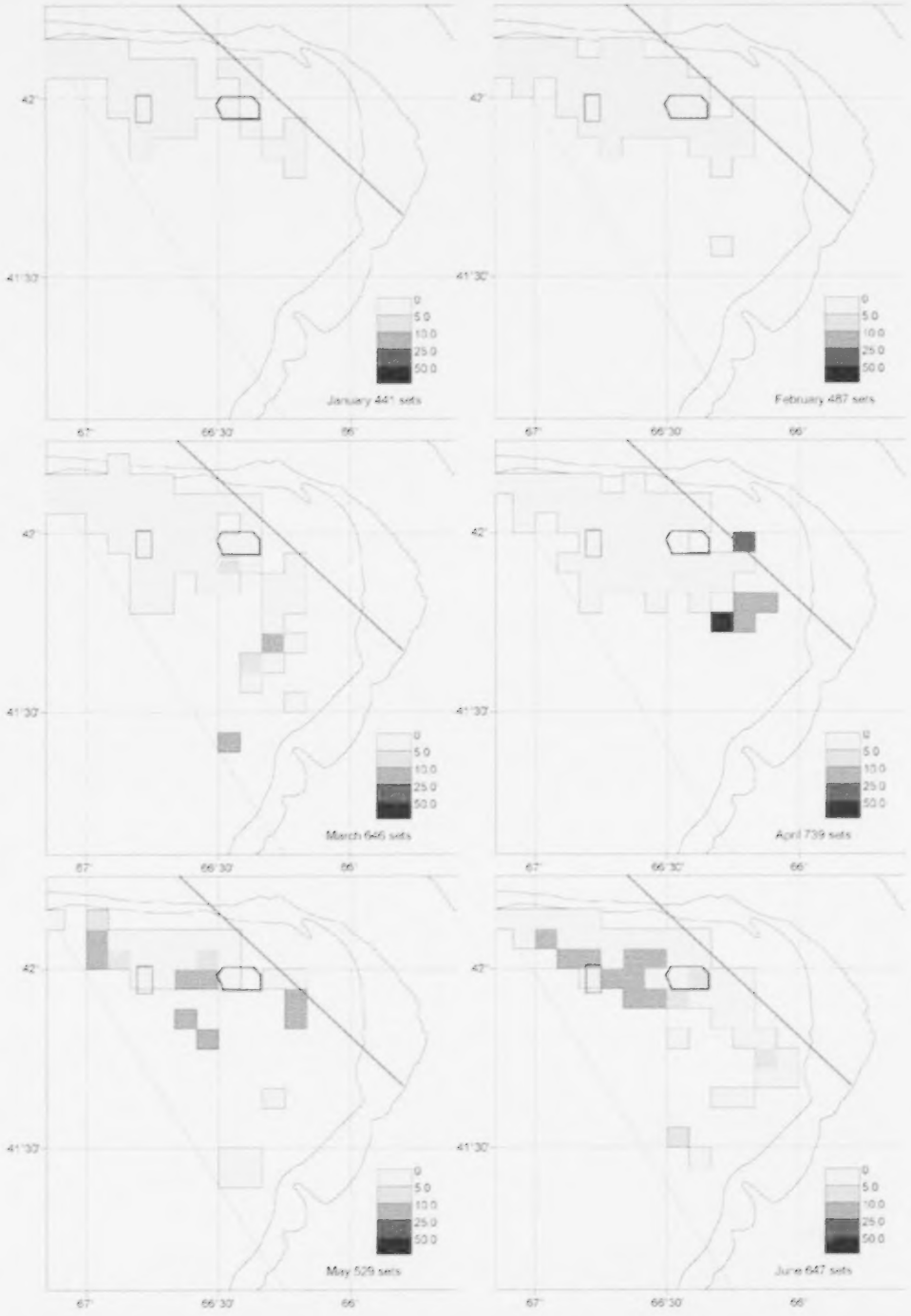

Figure 6: Average catch rates (kg/dredge) for yellowtail flounder from observed scallop trips from 2001 to 2012 (except 2003) on Georges Bank. The areas outlined in red (seed) and blue (grow-out) are the voluntary scallop closure areas that were implemented in January 2012. The diagonal red line indicates the division between the scallop management areas of Georges Bank 'a' and Georges Bank 'b'.

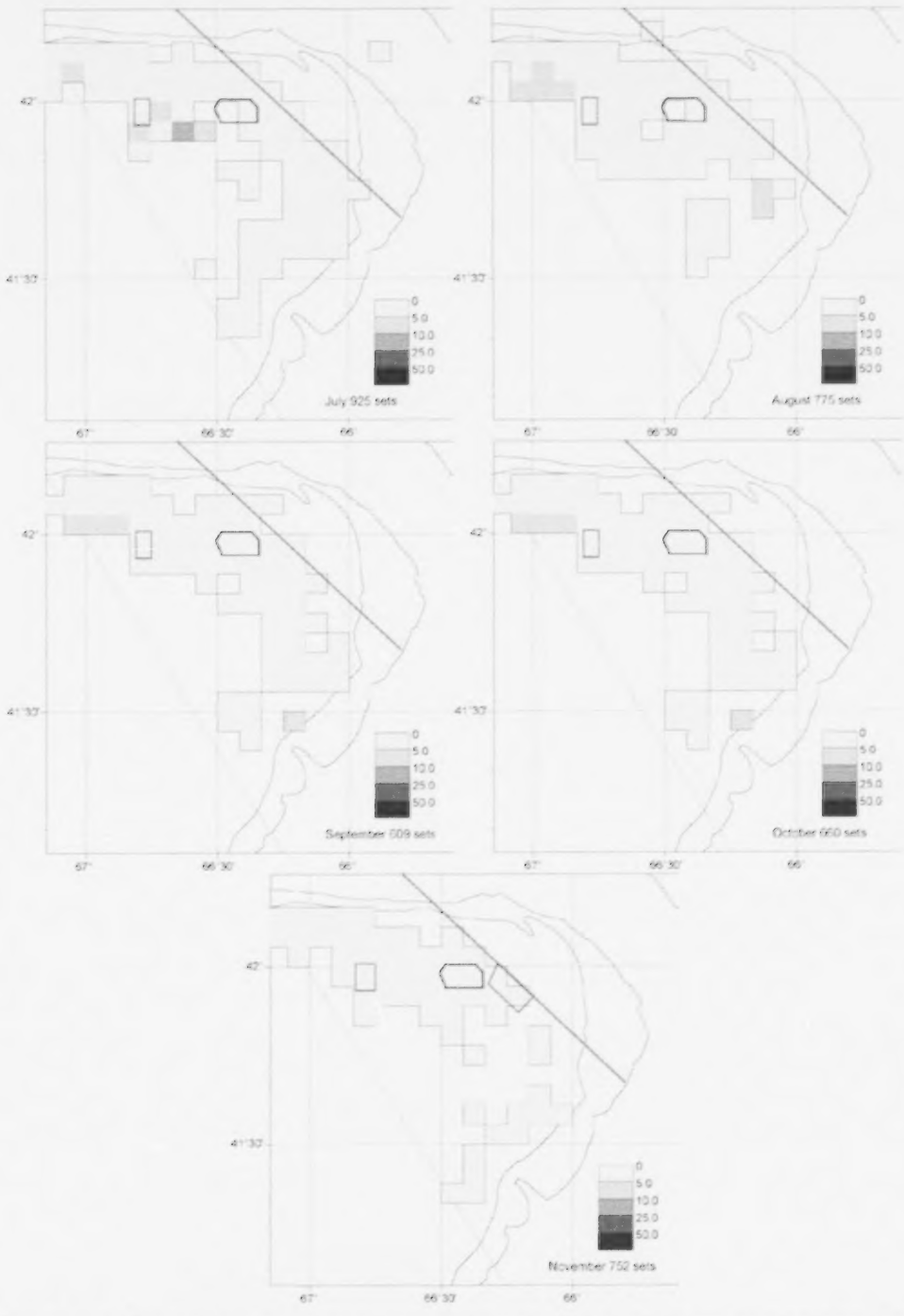

Figure 6 (continued): Average catch rates (kg/dredge) for yellowtail flounder from observed scallop trips from 2001 to 2012 (except 2003) on Georges Bank. The areas outlined in red (seed, modified November 2012) and blue (grow-out) are the voluntary scallop closure areas that were implemented in January 2012. The current voluntary closure areas, including an additional one indicated in green added in November, are indicated in the last panel. The diagonal red line indicates the division between the scallop management areas of Georges Bank 'a' and Georges Bank 'b'.

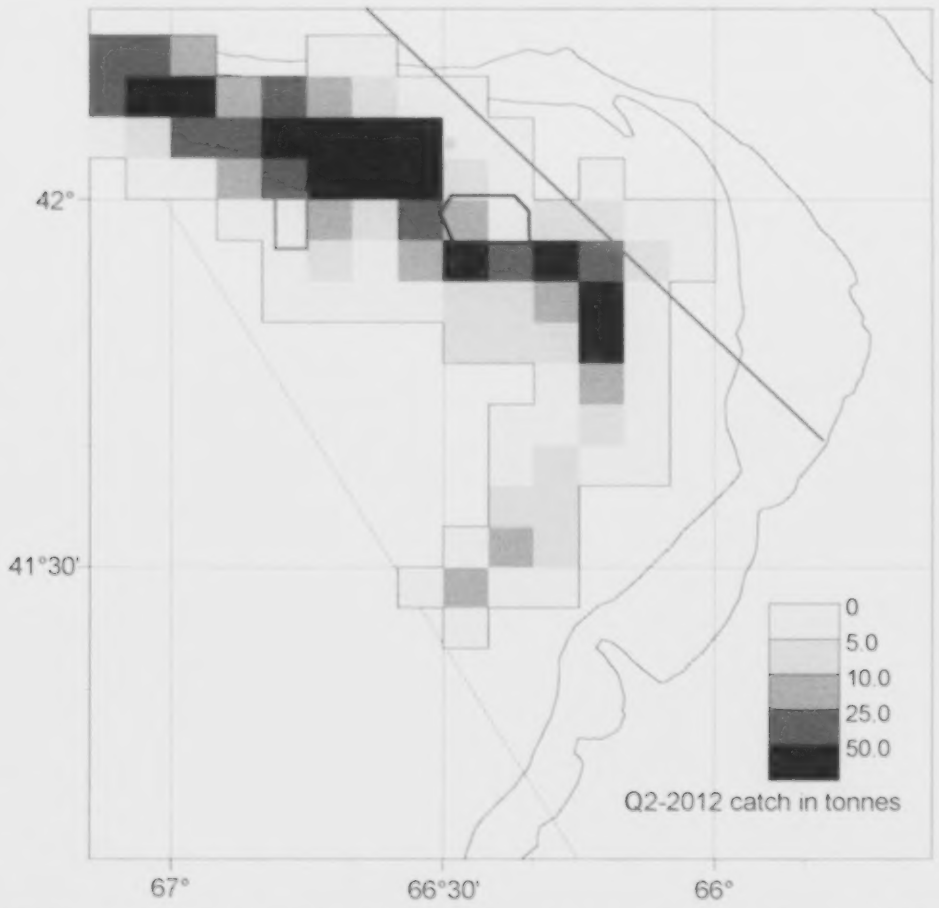

Figure 7: Distribution of offshore scallop catches (mt of meats) during the second quarter of 2012. The areas outlined in red (seed) and blue (grow-out) are the voluntary scallop closure areas that were implemented in January 2012. The diagonal red line indicates the division between the scallop management areas of Georges Bank 'a' and Georges Bank 'b'.

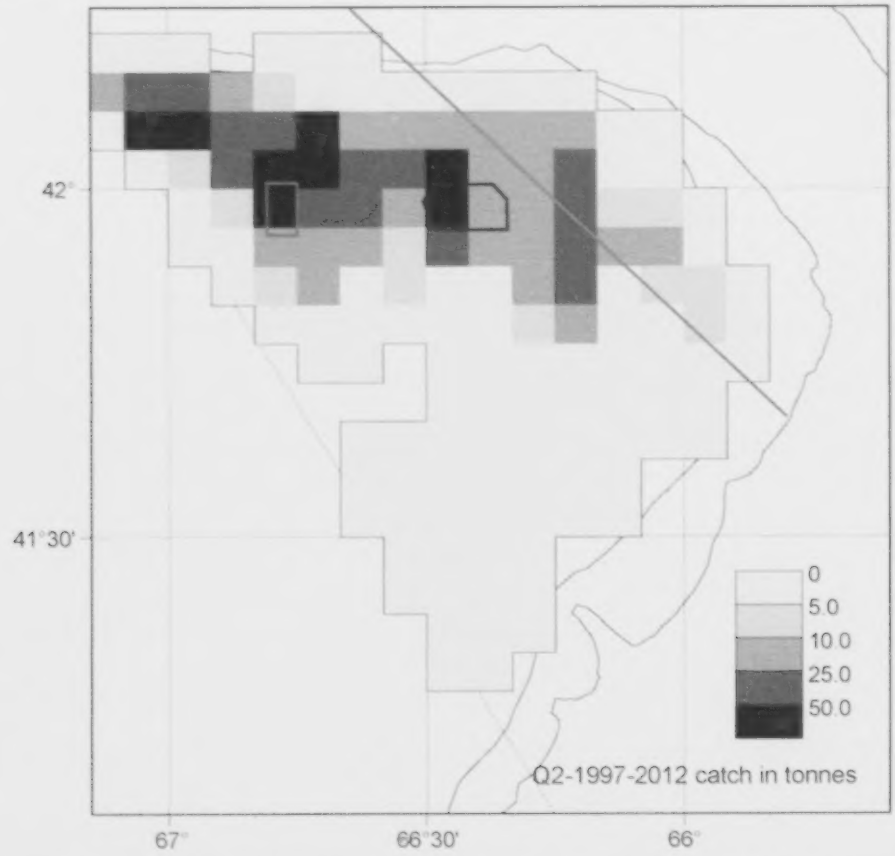

Figure 8: Average scallop catch (mt of meats) per cell during the second quarter of the period 1997 to 2012. The areas outlined in red (seed) and blue (grow-out) are the voluntary scallop closure areas that were implemented in January 2012. The diagonal red line indicates the division between the scallop management areas of Georges Bank 'a' and Georges Bank 'b'.

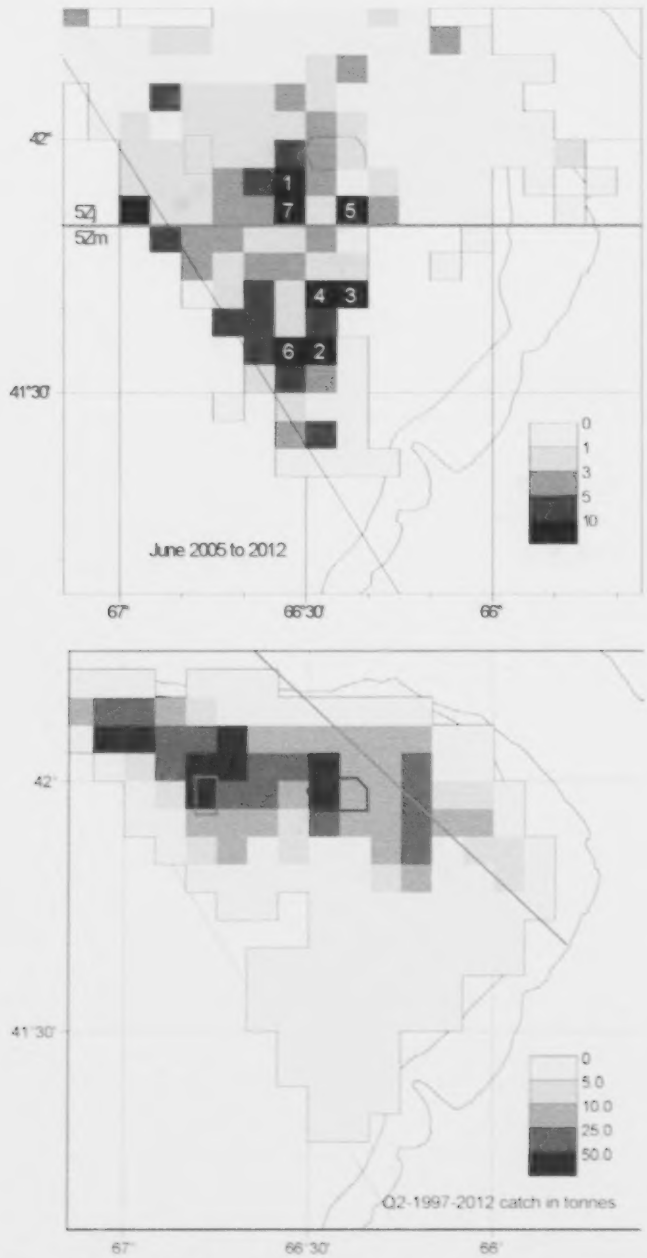

Figure 9: (Top Panel): Average yellowtail flounder by-catch rates (kg/hour aggregated by 5 minutes longitude x 3.33 minutes latitude) for the month of June, 2005 to 2012, for observed otter trawl sets on Georges Bank. Cells located on the Canadian side with rates greater than 10 kg/hour are labeled in descending order. The horizontal red line indicates the NAFO divisions 5Zj and 5Em.

(Bottom Panel): Average scallop catch (mt of meats) per cell during the second quarter of the period 1997 to 2012. The diagonal red line indicates the division between the scallop management areas of Georges Bank 'a' and Georges Bank 'b'. The areas outlined in red (seed) and blue (grow-out) are the voluntary scallop closure areas that were implemented in January 2012.

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